9 VAC 20-80-485.D Research, Development and Demonstration Plan. The plan of design and operation for any landfill which proposes a research, development and demonstration program shall include the items specified in this subsection. This alternative is only available to municipal solid waste landfills who meet the following requirements.

(1) GENERAL.

(a)

1. No landfill owner or operator may initiate a Research, Development and Demonstration Plan [RDD or Plan] without approval of a new permit or major permit amendment by the department. Landfill design or operation issues that research, development and demonstration plans are applicable to may include addition of off-site liquids to the landfill. Off-site liquids may be approved, provided that:

- adequate facility liquid storage volume is added to receive the off-site liquid,
- a list of proposed characteristics for screening the accepted liquids is developed, and;
- the quantity and quality of the liquids are compatible with the Plan.

Leachate, contaminated groundwater and gas condensate from the same landfill may provide additional liquid volume for accelerated decomposition of the waste mass. The research, development and demonstration plan may be proposed for other measures to be taken to enhance stabilization of the waste mass.

2. No landfill owner or operator may continue to implement a research, development, and demonstration plan beyond any time limit placed in the initial plan approval or any renewal without issuance of written

approval by the Department. Justification for renewals shall be based upon information in annual and final reports as well as research and findings in technical literature.

(b) Research, development and demonstration plans shall meet the following requirements:

1. Prequalification Requirements of a MSW Landfill. Research, development and demonstration applications shall be restricted to new or existing, permitted, active municipal solid waste landfills. The active landfill must meet all of the minimum design standards in 9 VAC 20-80. Any landfill that will recirculate leachate or add liquids less than 500,000 gallons per year into the waste mass that has a composite liner are not subject RDD. [Note: recirculating less than 500kgals/year in a landfill with a composite liner must meet recirculation requirements of 9 VAC 20-80-280] Existing permitted landfills that have triggered groundwater contamination or an exceedence in gas migration from any waste unit on site must be approved for active remediation, prior to or included with the RDD application. Since liquid addition to the waste mass at a landfill will increase gas production and possibly additional landfill odors; all landfills proposing RDD project must include an active gas collection system with flaring at a minimum. DEQ Air Division should provide an applicability determination of the RDD application to the Clean Air Act, i.e. Title V, NSPS or EG rule, etc.

Comment: Need Reg definition of active remediation

Landfills for disposal of municipal solid waste shall be designed with a composite liner and a composite capping layer or an approved Subtitle D Alternate

Liner. The approved Alternate Bottom Liner must contain a minimum of the following:

- a 60 mil HDPE FML,
- a GCL,
- 1 foot barrier layer with a minimum conductivity of $1 \text{ X } 10^{-5}$, and
- an aggregate leachate collection layer with a minimum permeability of $1 \text{ X } 10^{-1}$ cm/sec and no more than 12 inches of head on the liner.

The effectiveness of the liner system and leachate collection system shall be demonstrated in the plan. The landfill must have a method or device capable of measuring hydraulic head on the liner. For all landfills, the effectiveness of the liner system and leachate collection system shall be assessed at the end of the testing period, with comparison to the effectiveness of the systems at the start of the testing period.

2. Research, development and demonstration plans may be submitted for new landfills or expansions of existing landfills. Major permit amendments [9 VAC 20-80-500] for an RDD Plan that do not involve an increase in the landfill final grades or a lateral expansion of the footprint will not be subject to the landfill expansion criteria in 9 VAC 20-80-250 and 9 VAC 20-80-500 or the Code of Virginia.

3. Research, development and demonstration plans may include upgrade (for liquid addition) changes to the approved design and construction of subgrade preparation, liner system, and leachate collection and removal systems. Additional changes may be submitted with RDD; if they comply with Subtitle D design

standards or the changes attributable directly to liquid addition. These changes include receipt of bulk liquids, alternate schedule for final cover system, and modification of gas and leachate systems inside the limits of waste; and, temporary changes to run-off controls.

Comment: Need to exempt this process from a variance to the requirement for bulk liquids or leachate recirculation on alternate landfill liners, because it will be a federally approved program.

4. An annual report shall be prepared for each year of the testing period and a final report shall be prepared for the end of the testing period. These reports shall assess the attainment of goals proposed for the process selected for testing, recommend changes, recommend further work, and summarize problems and their resolution. Reports shall include a summary of all monitoring data, testing data and observations of process or effects and shall include recommendations for continuance or termination of the process selected for testing. Annual reports shall be submitted to the department within 3 months after the anniversary date of the written approval by the department. Final reports shall be submitted by the end of the testing period.

5. Implementation of an approved research development and demonstration plan shall comply with the specific conditions of the permit amendment for the initial testing period and any renewal. If the interim or final reports indicate that the goals of the project have been met, are reliable and predictable, the Department will provide a minor permit amendment to incorporate the regular operation of the project with the appropriate monitoring.

6. Structures and features exterior to the waste mass or waste final grades, pertaining to the Plan, shall be

removed at the end of the testing period, unless otherwise approved by the department in writing.

(2) OTHER REQUIREMENTS A research, development and demonstration plan shall include the following details and specifications. Processes other than adding liquids to the waste mass and leachate recirculation may be practiced in conjunction with the research, development and demonstration plan.

(a) Initial applications for research, development and demonstration plans shall be submitted for review and approval prior to the initiation of the process to be tested. Plans shall specify the process that will be tested, describe preparation and operation of the process, describe waste types and characteristics that the process will affect, describe desired changes and end points that the process is intended to achieve, define testing methods and observations of the process or waste mass that are necessary to assess effectiveness of the process, and include technical literature references and research which support use of the process. The plans shall specify the time period for which the process will be tested. The plans shall specify the additional information, operating experience, data generation or technical developments that the process to be tested is expected to generate.

(b) The test period for the initial application shall be limited to a maximum of 3 years.

(c) Renewals of testing periods shall be limited to a maximum of 3 years each. The maximum number of renewals shall be limited to 2.

(d) Renewals shall require department review and approval of reports of performance and progress on achievement of goals specified in the research, development and demonstration plan.

(e) Research, development and demonstration plans that evaluate introduction of liquids in addition to leachate or gas condensate from the same landfill shall propose measures to be integrated with any approved leachate recirculation plan and compliance with requirements for leachate recirculation.

(f) Research, development and demonstration plans shall include a description of warning symptoms and failure thresholds which will be used to initiate investigation, stand-by, termination, and changes to the process and any other landfill systems that might be affected by the process, such as gas extraction and leachate recirculation. Warning symptoms shall result in a reduction or suspension of liquids addition, leachate recirculation, investigation and changes to be implemented before resuming the process being tested. Failure thresholds shall result in termination of the process being tested, investigation and changes that will be submitted to the department for review and approval in writing prior to resumption of the process being tested.

(g) Research, development and demonstration plans shall include an assessment of manner in which the process to be tested might alter the impact that the landfill may have on human health or environmental quality. The assessment shall include both beneficial and deleterious effects that could result from the process.

(h) Research, development and demonstration plans shall include a geotechnical stability analysis of the waste mass and an assessment of the changes that the implementation of the plan are expected to achieve. The geotechnical stability analysis and assessment shall be repeated at the end of testing period, with alteration as needed to include parameters and parameter values derived from field measurements. The plan shall define relevant parameters and techniques for field measurement.

(i) Research, development and demonstration plans shall propose monitoring parameters, frequencies, test methods, instrumentation, record-keeping and reporting to the department for purposes of tracking and verifying goals of the process selected for testing.

(j) Research, development and demonstration plans shall propose monitoring techniques and instrumentation for potential movements of waste mass and settlement of waste mass, including proposed time intervals and instrumentation, pertinent to the process selected for testing.

(k) Research, development and demonstration plans shall propose construction documentation, construction quality control and construction quality assurance measures, and recordkeeping for construction and equipment installation that is part of the process selected for testing.

(l) Research, development and demonstration plans shall propose operating practices and controls, staffing, monitoring parameters and equipment needed to support operations of the process selected for testing.

(m) Research, development and demonstration plans that include aeration of the waste mass shall include a temperature monitoring plan, a fire drill and safety program, instructions for use of liquids for control of temperature and fires in the waste mass, and instructions for investigation and repair of damage to the liner and leachate collection system.

(3) TERMINATION. The department may require modifications to or immediate termination of the process being tested if any of the following conditions occur:
(a) Significant and persistent odors.
(b) Significant leachate seeps or surface exposure of leachate.
(c) Significant leachate heads on the liner.

(d) Excessively acidic leachate chemistry or gas production rates or other monitoring data indicate poor waste decomposition conditions.
(e) Instability in the waste mass.
(f) Other persistent and deleterious effects.

Since the RDD Program is an optional participation program, the applicant must certify that they acknowledge the program is optional; and that they are aware the Department may provide suspension or termination of the program for any reasonable cause, without a public hearing. Notice of suspension or termination will be by letter for a cause related to a technical problem, nuisance problem or for protection of public health and the environment